AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph beginning at page 4, line 29 with the following amended paragraph:

Accordingly, realizations of communications apparatus and methods employing such impairment compensation sequences and/or related techniques generally do not require updated software or hardware if and when new impairments are encountered in the field or when used in a particular communication networks. For impairments periodic in a predetermined number of phases of a an impairment compensation sequence (e.g., RBS-related impairments with periods of 6, 12, or 24 phases of a DIL sequence in accordance with the present invention), new types and/or combinations of impairments may be tolerated and communications facilities employing impairment compensation sequences and/or techniques in accordance with the present invention may conveniently adapt thereto.

B1

Please include the following new paragraph after page 8, line 8:

FIG. 7 depicts an exemplary V.90 modem realization in which Digital Impairment Learning (DIL) techniques in accordance with the present invention may be employed.

B2

Please replace the paragraph beginning at page 13, line 3 with the following amended paragraph:

Therefore, for illustrative purposes, symbol sequence **300** can be viewed as exhibiting twenty-four timing phases, e.g., phase 1, phase 2, ... phase 24. Of course, symbols transmitted in a given phase may be affected by multiple digital impairments, including multiple forms or sources of RBS. For example, in a digital channel including at least two portions, symbols transmitted in intervals corresponding to phase 2 (see **FIG. 3A**) may be affected by overlapping RBS contributions (or other

B3 Cont

digital impairment contributions) from each of the portions. Alternatively, RBS contributions (or other digital impairment contributions) may affect different phases. Whatever the overlap and phasing characteristics of the impairments, the resulting effects are guaranteed to be periodic in 24 intervals.

B3 cont

Please replace the paragraph beginning at page 14, line 17 with the following amended paragraph:

The specific requirements of Recommendation V.90 are well known (*see generally*, ITU-T Recommendation V.90, §§ 8.3, 9.3, which are incorporated herein by reference) and suitable implementations in accordance therewith will be appreciated by persons of ordinary skill in the art. However, to summarize operations in the context of **FIG. 2**, analog client modem **219** transmits a sequence requesting that digital modem **212** begin equalizer training. Analog client modem **219** then transmits a training signal, TRN. After training its receiver, digital modem **212** receives a sequence, J_a, from the analog client modem **219** and subsequently transmits a training signal, TRN_{1d}, for ~~used~~ use by analog client modem **219** in its equalizer and/or echo cancellation training. In an exemplary realization in accordance with Recommendation V.90, the sequence, J_a, encodes a DIL descriptor. A suitable format for the DIL descriptor appears in ITU-T Recommendation V.90, § 8.3, Table 12, which is incorporated herein by reference. Digital modem **212** and analog client modem **219** subsequently exchange sequences, J_d and J_d', and signals, S and $\overline{S}$, whereupon digital modem **212** transmits a DIL sequence corresponding to the DIL descriptor.

B4

Please replace the paragraph beginning at page 26, line 5 with the following amended paragraph:

For simplicity, much of the art assumes that a given phase interval is affected by a single form of RBS, rather than a superposition of multiple

B5 cont

forms. Similarly, it is often assumed that the single form of RBS affecting a particular sample is periodic in 6 phase intervals. Strictly speaking, neither simplification is necessarily valid. Instead, persons of ordinary skill in the art will recognize that individual portions of a communication channel may employ differing forms of RBS in various phase intervals. Accordingly, symbols conveyed over a communication channel in a given phase interval may be affected by multiple RBS forms or other impairments. Furthermore, as described above, the effects of RBS impairments may have periodicity of 12 or 24 phase intervals. Embodiments in accordance with the present invention may be particularly advantageous in that diagnosis of a particular RBS or other impairment is unnecessary. Whatever the particular forms of RBS active in a communications channel, realizations of the present invention may avoid diagnosis of the particular form(s) of RBS present in ~~a~~ an individual phase interval by instead categorizing the phase intervals into characteristic groups according to the similarity of observed impairments.

B5 cont

Please replace the paragraph beginning at page 30, line 28 with the following amended paragraph:

While a variety of suitable implementations will be appreciated by persons of ordinary skill in the art based on the above descriptions and pseudocode, the flow chart of **FIG. 4** illustrates one suitable sequence of operations. Initially, ~~amplitudes~~ amplitude estimates for one of the 24 phase intervals are treated (**402**) as representatives of a first characteristic group. Typically, estimates for phase interval 1 are assigned to the first characteristic group, although the particular phase interval assigned is arbitrary. In general, phase interval 1 may be subject to RBS, padding or no periodic impairment at all. Next, amplitude estimates associated with another phase interval (typically, phase interval 2) are evaluated against then current characteristic groups. In the illustrative realization of **FIG. 4**, evaluation includes calculating (**406**) a set difference measure (such as

B6 cont

described above) between amplitude estimates for the current phase interval (e.g., phase interval 2) and representatives of each characteristic group (e.g., group 1 characterized by amplitude estimates of phase interval 1). Based on comparison with each of the characteristic groups, a best matching characteristic group is identified. If the set difference measure meets a match criterion (e.g., if the set difference measure is below a threshold value), then the current phase interval may be added (**408**) to the matching characteristic group. If not, a new characteristic group is defined (**410**) using amplitude estimates of the current phase interval as representative thereof.

B6 cont'd

Please replace the paragraph beginning at page 38, line 1 with the following amended paragraph:

Referring illustratively to **FIG. 6**, an exemplary V.90 modem implementation employs a reduced state maximum likelihood sequence estimator and a partial response class V equalizer. A brief description of the illustrated modem will provide a context for better understanding some device embodiments in accordance with the present invention. A detailed discussion of the operation of the exemplary modem is omitted since modem operation in conformance with Recommendation V.90 is known the art. More detailed information may be found in the above-incorporated U.S. Patent Application and in Recommendation V.90. In an illustrative embodiment, partial response equalizer ~~**919**~~ **619** is implemented in software that may be stored on computer readable media that can be executed on a suitable processor. Those of skill in the art will appreciate that the teachings herein may be applied to a variety of modem and communication device implementations (see, for example, FIG. 7) including those employing a programmable digital signal processor (e.g., processor 702) and/or specialized logic.

B7